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ABSTRACT

With the dramatic growth in the use of computers in recent years, questions have been raised concerning the role of computer education in community colleges. Four principal reasons can be advanced for implementing an academic/instructional computing program: (1) to increase computer awareness among students to prepare them for the growing number of jobs requiring familiarity with computers; (2) to improve instruction through computer-assisted delivery; (3) to optimize the use of resources through computer management in the areas of student testing, tracking, counseling, and curricular resource management; and (4) to develop computer and computer-related skills as part of an effective curriculum. Before implementing an academic/instructional computing program, a college should first develop faculty and staff awareness. Next, the institution's objectives should be defined, the role of computer-assisted instruction assessed, and the costs evaluated. Success in instituting such a program requires dynamic leadership, consistent support, and a large measure of institutional and individual self-confidence. If realistic objectives and sensitive strategies are developed, faculty and staff will take greater pride in their institution, and graduates will be better prepared for jobs and further education. (HB)

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ACADEMIC/INSTRUCTIONAL COMPUTING IN THE COMMUNITY AND JUNIOR COLLEGE

Its Role and Its Institutional Implications

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ACADEMIC/INSTRUCTIONAL COMPUTING IN THE COMMUNITY AND JUNIOR COLLEGE

Its Role and Its Institutional Implications

Computing, especially microcomputing, has taken America by storm. Time magazine named the computer 1983 "Man of the Year," and the most talked about new products of the last two years have been the IBM PCjr and the Apple Macintosh. The drama of competition within the microcomputer industry dominates the Wall Street Journal and every magazine newstand. On today's television, computer commercials are more common than were cigarette commercials two decades ago. The microcomputer has replaced the automobile as America's everyman technology

Our schools have begun to accept computers, although costs have often limited educational programs to a couple of Apples under the auspices of a math teacher. Computers must become an integral part of our education, both because they are effective teachers and because every student needs to have basic computing skills. The public expects every elementary school, every high school, and every community college to have a computing program.

Unfortunately, the justifications for computing education are often poorly articulated and based on misguided notions that students must become computer programmers to be successful. The computing programs that are developed often reflect the biases of those few teachers and students who already use computers rather than represent a coherent strategy for implementing an instructional program.

Within the community college, there are four principal reasons for implementing an academic/instructional computing program:

- Computer awareness among students
- Computer-assisted delivery of instruction
- More optimal use of resources through computer management
- Development of appropriate computer and computer-related skills as part of an effective curriculum

COMPUTER AWARENESS

The need for computer awareness among employable Americans hardly requires justification. More and more, the jobs that are available to graduates of community college programs include computer or computer-related activities. Word processing is already a staple of the American office, and now office automation and management support systems are emerging as basic office functions. More than two million microcompu-

ters were sold in 1982, and twice that number in 1983. Spread-sheets like VisiCalc, wordprocessing packages like WordStar, and data storage and manipulation packages like dBase II and Lotus 1-2-3 are now found in businesses both large and small.

The term currently in vogue, "computer literacy," reflects the equation between reading competence and computer competence as fundamental components of an adequate education. One educator has gone so far as to state that elementary computer literacy prograss aimed at adults are now in the realm of remedial education. This may be a bit premature in 1984, but current projections indicate that by 1990, nearly 90% of all high school graduates will have had some computer experience during their school years.

Although popularly used, the term "computer literacy" is unfortunate because "literacy" implies that the competencies involved are analogous to reading and writing. Most computer literacy projects, picking up on this analogy, have focused on the reading and writing of computer code -- programming. But programming should not be the principal thrust of computer literacy. Computer literacy programs are aimed at novices, and their goal should be to make the novice computer user feel comfortable with computers. They should introduce students to the skills needed to make the computer perform in a useful manner. Microcomputers have been successful because of the vast array of applications packages available. A person can make effective use of a microcomputer without any knowledge of programming languages.

The role of the community college in developing computer awareness parallels the role of the community college in achieving verbal literacy. For some students, the community college provides remedial services -- this will always be true of computing just as it is true of reading and writing. But postsecondary institutions also refine and augment the basic skills already held by their students. Today the community college may need to focus on relatively basic levels of computer awareness among its students; in the future as its students arrive with higher levels of competence in the use of computers, the focus will expand. The community college of the late 1980s will provide both remedial and progressive instruction.

COMPUTER-ASSISTED INSTRUCTION

For years, computer-assisted instruction has been heralded as the new technological revolution in teaching. Quite frankly, the effectiveness of computer-assisted instruction (CAI) at the college level is still in question. Cuyahoga Community College, in Cleveland, has for four years supported the PLATO project in an effort to assess its effectiveness, and the results are quite mixed. Where individual faculty have made a firm commitment to the PLATO concept, they report major successes. But the number of faculty who have been persuaded to make the commitment remains small. The arguments used by faculty in resisting PLATO include disagreements over pedagogic content or approach and objections to the nature of the computer-student interaction. Many faculty are inflexible concerning the logistics of the PLATO laboratory and often their objections are trivial. Nevertheless, these objections reflect a fundamental rejection of the computer-as-teacher. Sometimes the judgment is based on job insecurity or psychological threat, but often it is based on genuine pedagogic judgment.

Other CAI media -- primarily microcomputers -- are received with more enthusiasm. Faculty who are "into microcomputers" either use commercially available packages -- and often express disappointment in their quality -- or develop their own programs. On every campus, there is now a small group of faculty (and they are as likely to be humanists as mathematicians or vocational education teachers) who are excited by CAI. Yet, overall usage patterns suggest that it will be some years, at least, before CAI becomes a major component in the instructional process in many community colleges.

There are a number of reasons why CAI has been slow to succeed in the community college environment:

- The vast majority of commodity CAI software is aimed at the K-12 level -- especially at grades 4 through 10.
- Despite claims to the contrary, the quality of most CAI is inadequate for the community college market.
- Commercially-available high-quality CAI is expensive.
- The labor-intensive naturr of CAI development and maintenance, although not well understood by institutional officials or by most faculty, keeps costs extremely high.
- Although hardware costs, especially for microcomputers, have come down sharply, the costs for a facility able to support large numbers of students simultaneously -- as in a laboratory environment -- are still substantial.
- The effective use of CAI within an existing program often requires extensive modification of teaching techniques and style and possibly even a redefinition of the objectives and evaluation procedures used in the course.

There are effective CAI modules available. In the basic skills area, especially, CAI is proving cost-effective and productive. There are other specific modules in areas such as nursing, pilot training, and economics, but there are few fully-developed curricula. The use of computer simulations in the teaching process should increase rapidly as schools come to realize that running a computer simulation is far cheaper than consuming laboratory facilities, and often more provocative than vague, general discussions. New teaching strategies will emerge, such as those based on using LOGO to teach problem-solving techniques.

RESOURCE MANAGEMENT

For those sensitive to the management side of the higher education business, the statement that computers will have an impact through the rational use and management of resources will come as no surprise. What may be surprising, however, is that I have included resource management within the academic/instructional computing rubric. Administrative computing systems -- admissions, registration, academic history, and financial aid systems as well as budgeting, financial accounting, and personnel/payroll systems -- have for some years aided in the management of colleges and universities. But there are at least four areas where resource management clearly falls in the domain of the instructional process:

- o Testing (diagnostic, prescriptive, and evaluative)
- o Student tracking
- o Student counseling
- o Curricular resource management

These functions can all be performed by an integrated computer-managed instructional (CMI) system. For effective CMI, courses must be built tightly around objectives, and include definitive measures of mastery. Often these measures can be taken directly by the computer through sophisticated computer-assisted testing. Sometimes the instructional process also uses the computer, and once again the record keeping is automated. At other times, the instructional process and evaluation are totally independent of the computer. Nevertheless, the computer can act as a recorder for student activities.

The key to the effectiveness of integrated computer-managed instruction is the identification of program, course, and module objectives. Once the objectives are intelligently defined (and that is undoubtedly the most difficult part of the process) the computer

software can be relatively easily implemented to monitor student progress, prepare evaluations of the effectiveness of different pedagogic strategies, and index the college resources (with costs) used for different programs.

Program or college-wide testing banks will lead to a rational, structured curriculum. This will mean that students -- as consumers -- will have a well-defined educational experience and that college administators -- as managers -- will have a firm grasp on the expected results of the various courses and programs offered by the college. In many programs, the idiosyncracies of individual sections impede the rapid progress of students because students come to advanced courses with highly inconsistent preparation.

The use of college-wide examination banks will allow the standardization of specific courses from teacher to teacher and campus to campus. It will also lead to more efficient use of individual faculty time, since computer-managed instruction will allow faculty to spend less time on the routines of bookkeeping, and allow them to devote more time to the creative aspects of teaching. Current estimates suggest that faculty may free up as much as 20% of their time in some areas through the introduction of computer-managed instruction.

Computer-managed instruction also permits more effective student counseling since detailed data on student achievements, assessment test results, and educational experience are quickly and accurately available to counselors. It is always difficult to plan out a student program, but the more information available on a student's past performance and abilities, the better the counseling can be, and the more efficiently the college's resources can be utilized to work with the student.

Computer-managed instruction will also allow the college to rationalize the use of non-human and human resources in the teaching process. At the Redrock Campus of Denver Community College, Dr. Barry Noonan is implementing a system whereby the various non-human resources (handouts, films, tapes, texts, charts, etc.) used in courses are being cataloged, by course objective, so that the course development process becomes institutional rather than individual. New faculty have a far easier time developing courses when they have a prepared catalog of relevant resources. Beyond that, however, materials developed for one course are now being more heavily used in other programs because of the effective cross-referencing that the computer makes possible. Demonstrations of

leverage developed for the diesel engineering course are now being used in the Redrock nursing program because they were cross-referenced under the concept "fulcrum dynamics."

But equally important, a CMI System will provide data on the human component of the educational process. We already have effective ways of tracking faculty workloads, but a properly implemented CMI System can go far beyond that. At San Diego's Mesa College, a bar-code reader and an IBM XT now track student use of the Independent Learning Center. Similar projects under development at other colleges will track student use of tutoring services and counseling services. These data are necessary to justify state subsidies and to assure a proper balance of tutors in the various subject areas while maintaining a strict budget.

TECHNICAL CURRICULUM

An academic/instructional computing program in a community college must support a technically sound curriculum, especially in the technical vocational fields. At most community colleges, a substantial majority of students are enrolled in vocational programs, seeking job skills with which to market themselves in today's occupational world. But many students are enrolled in technical fields -- health services, data processing, business administration, teaching, drafting, printing and typesetting, communications, or automotive repair, for example -- which involve computer technology.

The changes in computer technology over the last twenty-five years are incredible, and with the emergence of microcomputer technology, the next ten years will be even more dramatic. These may be trite statements, but the full significance of these truisms has not yet penetrated the institutional structure of most schools. Almost on an annual basis, each curriculum with a technical component must be reviewed to ensure relevance and to ensure that the skills being taught are appropriate. Batch environment data processing, secretarial typing, pen-and-ink double-entry bookkeeping and manual typesetting still exist in today's business world, but they are obsolete. No responsible college should be preparing its students for obsolescence. It is difficult for a college to keep pace with the occupational environment, especially in those areas where the job skills are dynamic. It takes a strong institutional commitment and firm executive leadership, as well as strong and creative faculty, to maintain the necessary technical relevance.

INSTITUTIONAL IMPLICATIONS

These, then, are the main reasons why a community college ought to develop a strong academic/instructional computing program. To develop such a program is a major undertaking. The first, most fundamental step is to develop faculty and staff computer awareness. This does not mean programming expertise, but rather a grasp of the range of functions a computer performs, a recognition of the types of problems a computer can address, and the role of the computer in the instructional process. Indeed, until that awareness is developed, it will be difficult to confront the other issues involved in developing an academic/instructional computing program.

The next step is to define, with precision, what the institution's objectives are. It must be decided what levels of general computer awareness are to be developed among students. The role of computer-assisted instruction in the institution must be determined, and the degree to which the college is willing to commit its own resources to courseware development defined. Computer-managed instruction can be developed for small areas of the curriculum, or made into an institution-wide management tool. And the college must clearly identify those technical areas where it desires to maintain educational leadership. These are not easy decisions.

Once the broader goals of the college have been defined, the college must consider the realities of cost. After assessing the current state of its academic/instructional computing program, and the current level of commitment to computing shown by its staff and faculty, the college must lay out a plan to implement the organizational and computer systems necessary to achieve its goals. It is in this phase that the realities of cost may well sharply modify the original goals.

The introduction of a strong academic/instructional computing program involves major institutional commitments to the following:

- Implementation and maintenance of an effective (and undoubtedly expensive) computing capacity
- Effective academic/instructional computing support staff, integrated into the college organization
- Effective curricular review process in those areas where it is desired to maintain educational leadership, including closer articulation between the institution and local industry and business
- Effective mechanism for working with the teaching faculty to develop an integrated Computer-Managed Instructional System

- Effective evaluation process to determine the degree to which the academic/instructional computing program is achieving its objectives and to provide a dynamic plan capable of changing the institutional objectives as the educational and occupational environments change
- Strong faculty professional development program to introduce technology in the context of their teaching
- Implementation of a clear set of incentives to encourage faculty to adopt (as appropriate in their fields) the academic/instructional computing program
- Development of a dynamic plan for funding the capital and personnel costs involved in implementing and maintaining a high-technology capacity which requires expensive hardware and expensive personnel

The institution developing an academic/instructional computing program cannot rely solely on computing professionals to define and implement the program, although clearly a professional staff is needed. Introducing a strong academic/instructional computing program is a process fundamental to the institution itself, and as such, requires an understanding and commitment by personnel at all levels. The policies of the institution must be shaped to support an academic/instructional computing program.

The process requires dynamic leadership, consistent support, and a large measure of institutional and individual self-confidence. Many faculty and staff will feel threatened by the unknown or resent the expenditure of funds involved, but institutional leaders who recognize the difficulties in innovation will define realistic objectives and develop sensitive strategies. The result will be faculty and staff with greater pride in their institution and alumni better prepared for jobs and/or further education.

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